“Phytochemical Analysis and Biological Activities of Latex from Euphorbiaceae Plants of Marathwada Region (MS)”

A

Synopsis

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1. A brief resume of proposed work /problem:

Plant latex has been used in folk medicine since it has clot including and dissolving properties in human hemostasis, wound healing and antimicrobial activity (Bohlooli, 2007) including various forms of cancer (Hartwell, 1967). The latexes are sources of various biologically active compounds(Dubey, 2003).

The plants will be collected from the different localities of Marathwada region. Theauthentificationof plants and families will be done from the herbarium or experts. The specimen will be maintained. The fresh plants will be collected early in the morning and latex will be collected by capillary action in glass screw cap bottle. A part of latex will be subjected to drying and remaining part will be stored in the refrigeration for further use. Dried material will be powdered using electrical blender and coarse powder will be used for extraction using differentorganic solvents.

The phytochemical and biological analysis will be done by usingstandard procedures (protocols). Standard cultures of pathogenic microbes (bacteria & fungi) will be procured from MTCC bank Chandigarh/ NCIM Pune for antimicrobial activity and all other chemicals will be used of analytical grade.

The antimicrobial activity will be done by well diffusion / cup plate/ paper disc method. The antioxidant activity of latex extract will be estimated using slight modified protocol reported by Chen *et. al* (1999). Anticancer properties by MTT assay (Igrashiand MIyazawa, 2001) and antidiabetic by using suitable method.

2. Introduction to proposed research topic:-

Nature gives very precious boon of vegetation, where plants are used to cure diseases. From the ancient practice, focus on utilization of plant as a medicine and it shows immense potential with respect to their medicinal value. The 21stcentury is witnessing serious scientific effort to ascertain major active ingredients in medicinal plants through research and development.

Marathwada region is one of administrative divisions of Maharashtra state which forms the vast Deccan plateau of India. It consist of eight district viz. Aurangabad, Beed, Jalna, Latur, Nanded, Osmanabad, Parbhani and Hingoli extends

from 70° 5' to 78° 5' east longitude and 17° 5'-20° 5' North longitude).explored to studies of traditional medicinal plants by botanists.

The increasing failure of chemotherapeutics and antibiotic resistance exhibited by pathogenic microbial infectious agents has led to the screening of several medicinal plants for their potential antimicrobial activity (Colombo &Bosisio 1996; Iwu et al. 1999).One way to prevent antibiotic resistance of pathogenic species is by using new compounds that are not based on existing synthetic antimicrobial agents (Shah, 2005).Plants have been a major source of medicine and the presence of plant secondary metabolites has been implicated for most plants therapeutic activities (Aibinu, 2006).

Various plants around the world is being used as folk medicine from generations as tribal and herbal practices which are yet to be phytochemically observed and biochemically analyzed and reported for therapeutical uses.Nearly all parts of plants contain moderate amount of bioactive ingredients with massive pharmacological properties. Among these, plant latex has much more attention in the research area because of its dazzling features in plant defense mechanism. Laticifer tissues from several plant species secrete the plant latex which is a protein rich multi-component fluid.

Plant latex is the milky juice, found in long branching tubes known as latex tubes. This juice is white, yellow or pinkish in color. It is a viscous fluid and colloidal in nature. Known ingredients of latex are proteins, alkaloids, tannins, terpens, starch, sugars, oils, resins, gums and enzymes (Pandey, 2001).

Latex has been reported to occur in 12000 plant species belonging to 900 genera. (Agrawal and Konno, 2009).

Plant latex is a good source of secondary metabolites such as alkaloids, tannins, saponins, phenolic components with potent antibacterial, antiviral, antifungal etc. bioactivities. These bioactive constituents of latex are also exhibits potent pharmacological activities like antitumors, anti-angiogenic, anti-diabetic, anti-proliferative, anti-arthritis, anti-inflammatory, antioxidant, antiasthmatic, anti-fertility, analgesic, immunomodulation, wound healing, cytotoxicity, vasodilatory activities. (Ujwala and Karpagam, 2013).

There is a continuous and urgent need to discover new antimicrobial compounds with diverse chemical structures and novel mechanisms of action for new and reemerging infectious diseases. The increasing failure of chemotherapeutics and

antibiotic resistance exhibited by pathogenic microbial infectious agents has led to the screening of several medicinal plants for their potential antimicrobial activity.

However, informationregarding the bioactive compounds and the therapeuticactvities of the locally folkoric plantsis still lacking.

In general, the study focused that there is enormous scope for traditional medicines in the villages of many parts of India as the rural communities collect the curative plant resources in and around their dwelling areas. Thus, the documentation of traditional system of medicines practiced by non tribal communities in other regions of our country is necessary to harness the wealth of medicinally valuable plants. Moreover, scientific validation of many species in terms of characterization of bioactive principles and their efficiency in treating various ailments are yet to be explored.

The present investigation was undertaken to elucidate phytochemical and pharmacological investigation of Latex of certain plants from Marathwada region with emphasis on phytochemical screening, antibacterial, antifungal,antioxidant, and anticancer activity.

3. Review of Literature:-

Mahajan (2008) analyzed latex obtained from twenty one plant species belonging to Khandesh region of Maharashtra, India.

Chougale*et al.* (2011) observed the ethanol and acetone extracts of latexes of 16 different plants were screened for their in vitro antioxidant and antimicrobial activity.

Ramappa (2011) observed latex extract were screened *in vitro* against human pathogenic strains such as Gram positive; *Staphylococcus aureus, Bacillus subtilis,* Gram negative; *Salmonella typhi, Klebsiellaphenonemia*and two fungal strains; *Aspergillus niger and Candida albicans*.

Shamkant (2011) revealed that *Euphorbia nivulia*Buch. – Ham. a member of *Euphorbiaceae*family its latex has different biological activities for the treatment of several ailments of human being.

Upadhyay (2011) studied Bioactives of plant latex possess anti-carcinogenic, anti- proliferative, anti-inflammatory, vasodilatory, antioxidant, antimicrobial, antiparasitic, insecticidal and wound healing properties.

Brahmbhatt (2012) had screened about fourteen laticiferous plants found in North Gujarat region vise *Calotropisgigantea, Jatropha gossypifolia, Wrightiatinctoria, Carissa carandas, Hibiscus sabdariffa, Moringaoleifera,*

*Holostemmaannulare, Azadirachtaindica, Holarrhenaantidysenterica, Mangiferaindica, Datura metel, Capparisaphylla, Riveahypocrateriformis*and *Hemidesmusindicus*were analyzed for the presence of possible secondary metabolites.

Murugan (2012) the leaf and latex extract were analyzed for the presence of phytochemicals and it was found to contain aminoacids, anthraquinones, flavanoids, Phenolic compounds.

Francesca *et al.* (2013) evaluated the acetylcholinesterase inhibitory capacity and the antioxidant properties of extracts of *Euphorbia characias*latex.

Madhavi (2013) assessed the potential antimicrobial activity of methanolic, ethanolic and chloroform extracts of fruit latex of *Artocarpusheterophyllus*against different pathogenic bacteria and fungus.

Madhavi (2013) observed quantitative phytochemical and Biochemical analysis estimations of assured active compounds like Total phenolics, flavonoids, tannins, proteins, carbohydrates, glycosides, and alkaloids were found to be in considerable quantities in fruit latex of *Artocarpusheterophyllus*.

Amit *et al.,* (2015) evaluated the antimicrobial activity, phytochemical studies and thin layer chromatography analysis of machine oil, hexane extract of seed oil and methanol extract of presscake& latex of *Jatropha curcas*Linn.

Rania Benjamaa1*et al.,* (2022)studied the chemical composition and biological activities of the latex from various species of the genus *Euphorbia*species latex.

Clarissa Marcelle Naidoo*et al.,* (2022)studied the chemistry, biological activities, and uses of latex from selected species of Apocynaceae.

Márcia Divina Vidal Silva*et al.,* (2023) studiedphytochemistry and biological activities of latex from *Schubertia grandiflora* Mart. (Apocynaceae).

Antony V Samrot*et al.,* (2023) studied plant latex: photochemistry, medicinal properties andapplication.

Olagunju, Esther Olajumoke*et al.,* (2016).studied phytochemical and antifungal activity of nigeriajatrophamultifudia latex.

Himanshu Sharma*et al.,* (2023).Studied importance, medicinal uses, phytochemicals and biological activities of *FicusRacemosa* L.

Snehal*et al.,* (2023). Studied pharmacological, biological activities and phytochemical constituents of *Calotropisgigantea.*

4. Objectives of Research:-

- Survey of laticiferous plantsfrom Marathwada region.
- Collection & solvent extraction of latex from certain plants from Marathwada region.
- Phytochemical analysis of latex using suitable protocols.
- To evaluate antibacterial activity against some human pathogenic bacteria.
- To evaluate antifungal activity against some fungal phytopathogens.
- To evaluate anticancer activity.
- To evaluate antioxidant activity.
- Toevaluate anti-diabetic activity.

5. Methodology to be adopted:-

Phytochemical analysis and biological activities of latex from plants of Euphorbiaceae family will be carried out *i.e.. Euphorbia milli Des Moulins, Euphorbia tirucalli L., Jatropha curcas L., Euphorbia heterophylla L.*

Collection of above plants from different localities of Marathwada will be carried out and solvent extraction of latex using suitable techniques.

Phytochemical analysis for alkaloids, total phenolics, tannins etc. will be done with the help of suitable standard methods.

Standard protocols and procedures will be usedfor evaluation of antibacterial, antifungal, anticancer, antidiabetic and antioxidant activity.

6. Importance of study/ Society application:-

International status-

Pathogenic resistance to synthetic chemicals causesnumerical problems worldwide. They are responsible for increased health (human and plants) costs as well as high morbidity and mortality particularly in developing countries. The increase in the prevalence of multiple drug resistance has slowed the development of new synthetic antimicrobial chemicals and has necessitated formulating new plant based alternatives. Thus present research will represent a potential source of natural biomolecules for the treatment of some bacterial and fungal infection in plant and human beings.

National Status-

The plants posses therapeutic properties or exert beneficial pharrmocological effect on the animal body. In current scenario of medical and pharmaceutical advancement, microbes involve in the change of their metabolism and genetic structure to acquire resistant against the drugs used in the treatment of common infectious disease. The plants have the capacity to produce large number of organic chemicals called as phytochemicals. The most of laticiferous plants belonging to different families possess therapeutic properties due to presence of phytochemicals. These phytochemicals from latexmay be used as antifungal, antibacterial agents against human and plant pathogens. It can also be used for the treatment of cancer, as antioxidant and anti-diabetic agents as alternative for chemotherapeutics.

Regional status-

The laticiferous plants are commonly available in the region. Nearly 10 % of all flowering plants (angiosperms) contain latex as milky fluid.thelaticiferous system is present in all parts of the mature plant, including roots, stems, leaves and sometime fruits. It is a complex emulsion consisting of proteins alkaloids, sugars, oils, tannins, resins and gums that coagulate on exposure to air it serves mainly as defense against herbivores insects.

The latex can be easily collected/ extracted from laticiferous plants and evaluated against harmful microbes under laboratory conditions. Furthermore it can be screened for their antioxidant, anticancer and antidiabetic properties.

Scope of the study:-

Various plants around the world is being used as folk medicine from generations as tribal and herbal practices which are yet to be phytochemically observed and biochemically analysed for therapeutical uses.

Hence present research work is significant because-

- The latex of certain plants mightrepresent a potential source of natural biomolecules for the treatment of infection.
- This hypothesis can be obtainingplant based medicine beneficial to human and plant health for treatment of diseases (bacterial and fungal).

- Current research is now directed towards finding naturally occurring properties as antioxidants, anti-diabetic and anticancer agentsof plant origin
- The primary benefits of latex derived medicines may be relatively safer than synthetic alternatives, offering profound therapeutic benefits and more affordable treatment.
- The goal of the present work is to explore the phytochemicals and biological properties of plant latex from Marathwada region.

7. Proposed work plan- with a tentative chapter scheme:

The present work will be divided into two parts the first part of work would be fully devoted for collection/ solvent extraction of latex from certain plants. The latex from different plants will be phytochemically analyzed by suitable methods.

The second part of the work would be mainly on *in vitro* screening of antibacterial, antifungal, antioxidant and anticancer properties of latex.

8. Year wise plan of work and targets to be achieved:

Sr.No.	**Year**	**Target to be achieved**
1	**2023-2024**	• Collection of relevant literature and survey of latex secreting plants from different parts of Marathwada region. • Collection of latex secreting plants/ plant parts, latex and standardization of methodology.
2	**2024-2025**	• Phytochemical analysis of selected latex secreting plantsand latex by using suitable techniques and solvent extraction. • Evaluation of antibacterial, antifungal activity against some human bacterial pathogens and fungal phytopathogens.
3	**2025-2026**	• Evaluation of antioxidant and anticancer properties of latex using suitable techniques. • Compilation of experimental result / data, submission of final synopsis and thesis.

9. Expected outcome:-

The solvent extract of latex collected from certain laticiferous plants may rich in flavonoids, tannins phenolics, alkaloids etc. On evaluation as antibacterial, antifungal, antioxidant, antidiabetic and anticancer properties they may show fairly

well and some significant results. This work may pave a way to develop therapeutic strategy from natural resources.

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